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A comparison between the sustainable management plans: The Menominee Forest vs. Algonquin Provincial Park

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by

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A COMPARISON BETWEEN THE SUSTAINABLE MANAGEMENT PLANS: The Menominee Forest vs. Canadian Crown Land

by

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ABSTRACT

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Key Words: Sustainable, management plan, Menominee, Algonquin, indigenous, wildlife, vegetation, soils, productivity, historic

This is a comparison between the sustainable management plans of the Menominee Forest and Algonquin Provincial Park. The importance of this thesis is to underline the importance of the attaining the most sustainable means of management with impending climate change. The comparison is a comprehensive way to lay out information and make decisions based on facts. This comparison is based on the state of the historic forest versus the current day forest, which is further sub-divided into vegetation, wildlife, soils, and productivity. Another topic that is discussed is the impact of indigenous involvement on management. The conclusion of the discussion based on those factors mentioned above, is that the Menominee Forest is the more sustainable of the two.

CONTENTS

TABLES

FIGURES

ACKNOWLEDGEMENTS

I would like to thank first and foremost, my first reader Will Wilson for helping through this whole process and for giving me direction when I was at a loss. I would like the next thank you to go to my support team, I would not have made it through this year without them. That includes my immediate family of Mom, Dad, Marie and Aaron, as well as my roommates Cyd, Kayla and Dani. Lastly I would like to thank Jenn, she will always be the heart of the NRM program. Her communication throughout the years has kept me posted and has never been more important than at the end of this year, and for that I am grateful.

1. INTRODUCTION AND OBJECTIVES

The sustainable management plans of the Algonquin Provincial Park (Figure 1) and Menominee Forest (Figure 2) are not equally effective in their components of long-term environmental impact (land, water, air, flora and fauna), and productivity. Ontario Crown Land, like all Provincial Parks, is managed under the Crown Forest Sustainability Act and has been instituted and maintained since 1994. Meanwhile the Menominee Forest is managed by the Menominee people, who have sustainably managed this land for over one-hundred and fifty years.

The purpose of this thesis is to do a comparative study between two sustainable management plans. This thesis will be looking at the following components of sustainable management plans: the historical ecological integrity of both sites; the current ecological integrity of both sites; and the productivity of each of these forests. The pros and cons that arise through the comparison of the forests at a historical and current level will be the basis of the comparison. The productivity of each will then determine the overall effectiveness of each sustainable plan.

Forestry is naturally a large part of the management of these forests and it is important to consider how it is affecting the overall ecological integrity of each forest. After an analysis of all this research, areas for improvement in each will be investigated. These areas should be very prevalent once a full analysis of the historical, current and production data of the Menominee and Algonquin forests is put together.

As the world's population increases and the need and use of our natural resources continues to rise, the importance of sustainable management plans is paramount to the future of our environment. It is important to continually look at the

plans we have in place, in order to evaluate their effectiveness and make necessary changes. There is also the matter of comparison as a means of evaluation and this is a useful tool that is often overlooked in the political and scientific world of forestry. With impending climate change alongside the consistent need for natural resources, this form of research has the potential to highlight important change to those plans that need it. The research done in order to attempt to answer the question, of which sustainable management plan is more effective, will be taken from a broad variety of sources. The bulk of the research will come from scholarly articles, books and archival data on both forests.

The Ontario Crown Forests, as well as the Menominee Forest have long standing pasts with harvesting being consistent in both, and that will be the basis of this research. A historical approach to this project is key in order to consider the point at which both forests were truly thriving, before any anthropogenic disturbances. This allows for a clean slate and something of a baseline in order to compare the state of the forests now.

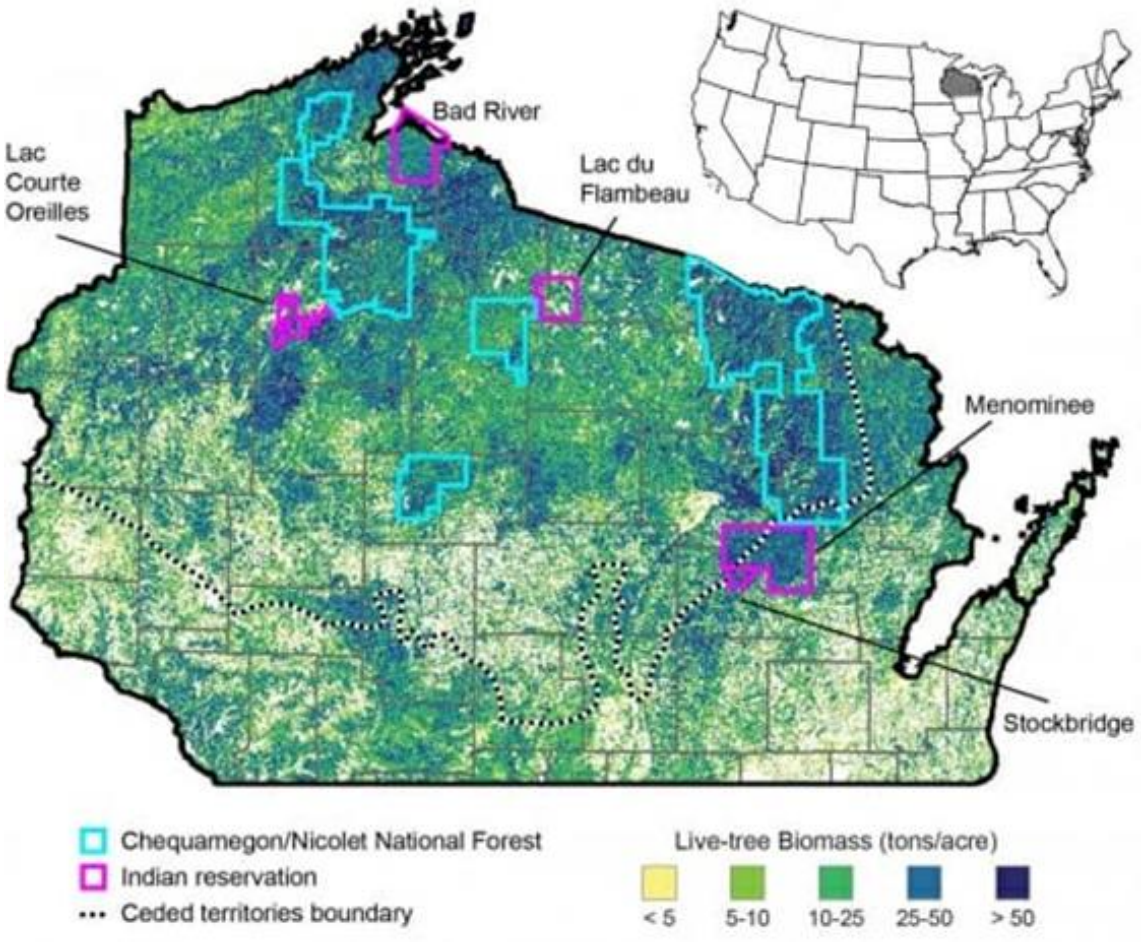

Figure 1. Map for reference of Menominee Reserve (Hamilton 2018).

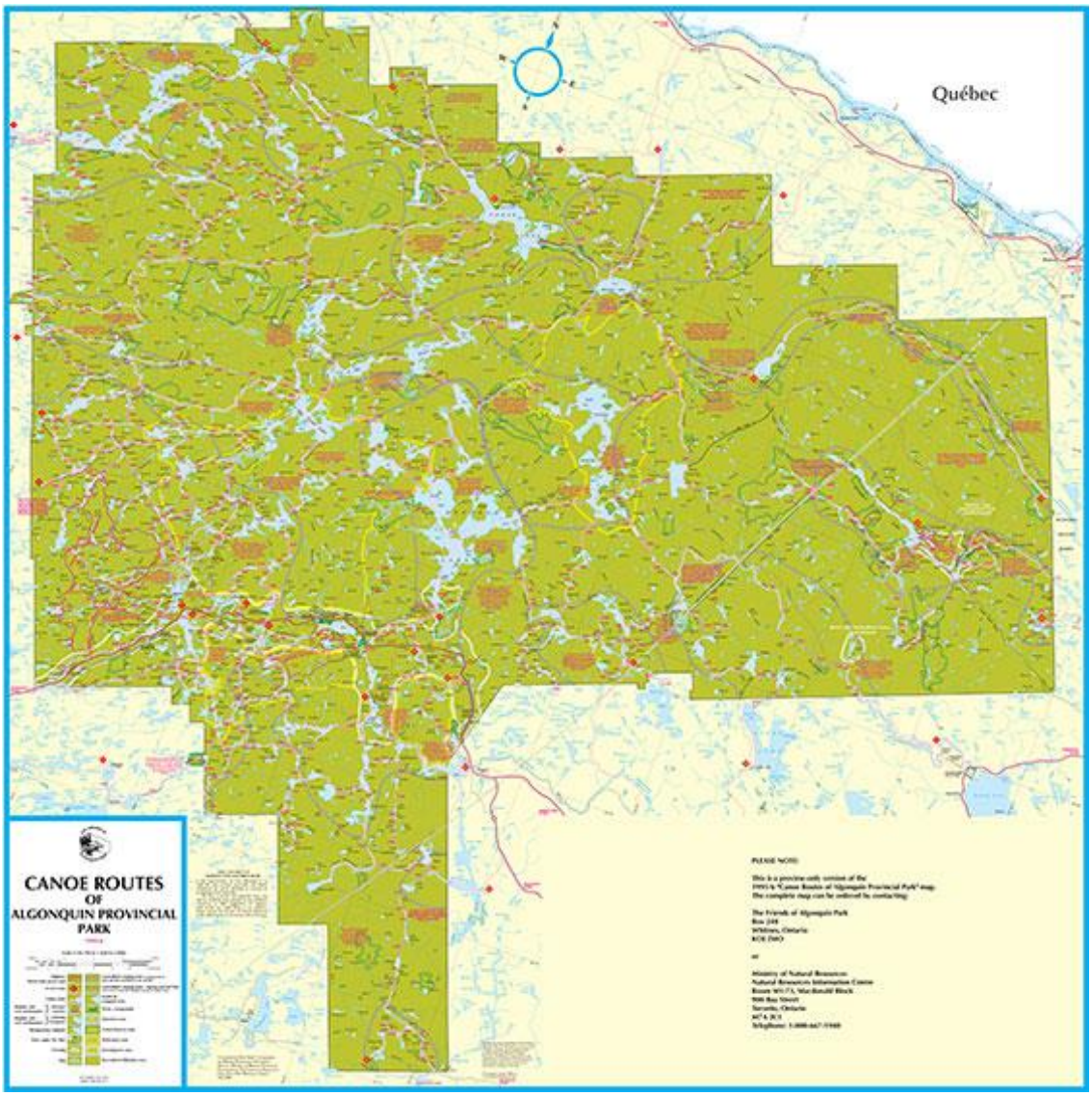

Figure 2. Map of Algonquin Provincial Park for reference (2019).

2. LITERATURE REVIEW

The comparison of the sustainable management plans of the Menominee Forest and Algonquin Provincial Park is a test. It will test the idea that Ontario is using the most sustainable practices for forestry on which it prides itself. In order to make this a fair test there must be a baseline time during which the forests were at their most sustainable. In this case, the consideration is the time before colonialism and settlement for both forests. The forests will then be analyzed both at that historical point, as well as their current states. Vegetation, wildlife, soils and the ecosystem as whole will be the key factors. Therefore, this literature review will cover a wide variety of aspects, including those mentioned above, as well as the histories, current management practices of the forests, and a brief overview of the land claims in Algonquin.

2.1. MENOMINEE FOREST

2.1.1. Historic Forest

The Menominee Forest, as in all forests, has changed since humans started disturbing it. This is despite the focus that Menominee people have had on sustainability for hundreds of years (Burgess 1996; Dockery 2012; Marinette Count Government 2017). The Menominee Forest was not always "disturbed" by humans as the Menominee people lived in harmony with the land for a long time before settlement and colonization (Dockery 2012, Beck 2002). Colonization of areas in and around today's Wisconsin started in 1634, when the European explorer Jean Nicolet arrived in search of the Northwest Passage (Dockery 2012). By 1672, France had laid claim to the land. Those claims have gone back and forth throughout history, but in the end, it is

Menominee land (Beck 2005; Dockery 2012). The history of this land currently known as Wisconsin is immense and deeply engrained in the history of the Menominee Peoples (Beck 2005; Beck 2002). They are intertwined with one another, each one as important as the other according to this study (Beck 2005). According to most historians the Menominee people originated on that land and have almost no migratory history (Beck 2002). All of this is to say that the Menominee People have always had a commitment to sustainability and to the forest itself (Beck 2002). For more than 150 years, they have maintained a level of sustainability that many forests have not attained, even in today's day and age (Beck 2005; Burgess 1996; Marinette Count Government 2017; Beck 2002). This drive for sustainable management stems from those connections to the earth that the Menominee people have practiced for thousands of years (Beck 2005; Burgess 1996; Marinette Count Government 2017). This involves the belief that their health and wellbeing is directly related to that of the forest (Waller 2018). The understanding that causing adverse effects to the environment will have a direct and negative personal impact on them would be cause for the subsequent effect on forest management (Dockery 2012). The Menominee people have a unique take on forest management because it is a lifestyle, a part of their past and their future (Beck 2002). The Menominee people of Wisconsin fought not to have control of the forest, but instead just to continue as an integral part of the forest from which they originated.

2.1.2. Current Forest

The Menominee people have been using the forest for sustainably harvesting wood for over 150 years. Menominee Tribal Enterprises, as they are known today is considered to be one of the most sustainably managed forests in the United States and

can boast international recognition (Dockery 2012; Menominee Tribal Enterprises). They pride themselves on having a management plan with the utmost levels of ecological viability, economic feasibility, and social desirability (Menominee Tribal Enterprises 2020). One of the most important aspects of their current management plan is that their core values and morals have not changed (Menominee Tribal Enterprises 2020). The Menominee people have always maintained the belief that those harming the forest in anyway is the equivalent of hurting themselves. They have also adopted the philosophy of "what's the best for the forest" (Menominee Tribal Enterprises 2020). The more practical side of the philosophy focuses on using area and volume control along with even-/uneven-aged management to maintain a healthy forest (Patton 2010). Another component of the practical philosophy is organization, which counts 884 continuous forest inventory plots in 109 compartments (Patton 2010). Along that same practical philosophy, there are also limits on allowable cutting not to exceed 7% annually, 3% in a 5 year period and 2% over a 15 year cutting cycle (Patton 2010). As of right now the Menominee Forest works under adaptive sustained yield procedures, this is applicable within the wide variety of forest types, habitat niches and age classes (Menominee Tribal Enterprises 2020; Patton 2010). Maximum diversity in all aspects of the forest, habitat diversity, and the optimization of growth and quality of saw logs are the goals for forest management (Menominee Tribal Enterprises 2020). Menominee Tribal Enterprises is also Forest Stewardship Council Certified (FSC), which is to say that the forest upholds all those standards and policies that are set out by the FCE (Menominee Tribal Enterprises 2020). The FCE is a relatively rigorous council with standards that are not met by many due to their strict natural requirements (Menominee

Tribal Enterprises 2020). The Menominee Tribal Enterprises lumber is also green certified under the United States Green Building Council (USGBC), and therefore, the Leadership in Energy and Environmental Design (LEED) certified as well. As productivity goes, the wood/lumber options for sale are white ash (*Fraxinus Americana*), aspen (big-tooth and quaking) (*Populus grandidentata* and *Populus tremuloides*, respectively), basswood (*Tilia americana*), beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadenis*), eastern white pine (*Pinus strobus*), hard maple (*Acer saccharum*), pin oak (*Quercus palustris*), red oak (*Quercus rubra*), red pine (*Pinus resinosa*), soft maple (*Acer saccharinum*), and yellow birch (*Betula alleghaniensis*) (Menominee Tribal Enterprises 2020). Those options available for cutting are rough sawn lumber, veneer logs, pulp wood, by-products, and kiln drying. These options can all come in one of 6 classes; green, air-dried, pre-dried, kiln-dried, heat treated, and FSC-100% (Menominee Tribal Enterprises). In terms of visitors to the forest each year, there seems to be a lack of information for the Menominee Forest. The Menominee people who oversee the management of the forest, as well as the rest of the tribe (of 701 people in Wisconsin) are the main visitors of the forest (Wisconsin Department of Public Instruction). Past that there is minimal information on any recreational use of the forest.

2.2. ALGONQUIN PROVINCIAL PARK

2.2.1. Historic Forest

The history of Algonquin Provincial Park, in comparison to the history the Algonquin peoples and their lands, is brief, but inextricably intertwined with the people (Algonquin Forestry 2020; Whiteduck 2009). The relationship that the Algonquians

have with the forest was considered beautiful and was openly displayed before the times of European settlement and colonialism (AVES Ltd. 2010; Whiteduck 2009). The semi-nomadic lifestyle that they lived, along with their awareness for the workings of the forest, allowed the Algonquians to leave a very minimal impact on the land (Whiteduck 2009). Living in tune with the land, moving from season to season in order to hunt only in those places of abundance, and taking only what was needed, allowed them to leave the rest alone (AVES Ltd. 2010; Whiteduck 2009). Then came the settlers, starting with Samuel de Champlain, arriving sometime in the early 1600's as the first European to lay eyes on "untouched resources" (Algonquin Forestry 2020; Whiteduck 2009). After this, prospects just got worse for the Algonquian peoples. Unlike the Menominee people, the Algonquians fought for their lands and lost to the colonialists (Algonquin Forestry 2020; Whiteduck 2009). By the 1800's, early western forestry was being practiced and the once huge old-growth trees were gone, affecting the ecosystem in its entirety (AVES Ltd. 2010; Whiteduck 2009). In 1894, Algonquin Provincial Park became Ontario's first Provincial Park (Corbett 2001). The forestry in and around the area that is now Algonquin Provincial Park continued and improved along with technology and Canada's forest policy (Algonquin Forestry 2020). Some of the more important dates, policies and legislation in regard to this is discussed in the Policy and Legislation section below. To this day the Algonquian people that inhabited the land for thousands of years have no control over what is now known as Algonquin Provincial Park (Whiteduck 2009).

2.2.2. Current Forest

Algonquin Provincial Park is 7635 km^2 in its entirety, and with current day forestry practice. It is an adequate example of how forestry on protected Crown land is being managed all over Ontario (Algonquin Forestry 2020). The Algonquin Forestry Authority (AFA), an Ontario Crown Agency established in 1974 by Bill 155, oversees upholding sustainable forest management in the park (Corbett 2001). Those standards being upheld, are found under the Algonquin Forestry Authority Act (1990) and the Crown Forest Sustainability Act (1994); plans follow the Forest Management Planning Manual (Algonquin Forestry 2020; Benidickson 2009; Corbett 2001) which consists of precise directions on planning, implementation, monitoring and reporting processes (Ontario 2014). There is also the Forest Information Manual which covers the mandatory requirements, standards, roles and responsibilities, timelines, and conditions to follow and/or meet while managing Crown land forests (Ontario 2014). The Forest Operations and Silviculture Manual is yet another guide that sets out those accepted methods of forest management, as well as the standards for forest operations and approaches to silviculture (Ontario 2014). That manual also goes over those minimum qualification requirements for forestry employees, procedures for the assessment of forest management in Ontario, and measures to assess performance of forest operations (Ontario 2014). All those documents are fairly broad and cover all forestry in Ontario.

There is more specific documentation regarding the management of Algonquin forests, which includes the Algonquin Provincial Park Management Plan (1998, with amendments last in 2013) (Benidickson 2009; Ontario 1998; Algonquin Forestry 2020).

All the above manuals combine to achieve the goal of sustainability (defined as it is in the Crown Forest Sustainability Act). Making up about 44% of the volume harvested yearly from all Central and Eastern Ontario Crown forests, Algonquin Forestry is a huge economic factor in Canada (Algonquin Forestry 2020). The 2018/2019 harvest level was 368,699 m^3. From that total, the products sold by the AFA were: hardwood and softwood lumber, utility poles, pulp and paper, packaging products, oriented strandboard, and fuelwood (Algonquin Forestry 2020).

There are two main methods of harvesting in Algonquin Provincial Park; one of these is partial cutting which makes up about 95% of harvesting, through selection or shelterwood, and the other method is clearcutting with standards (Algonquin Forestry 2020). The AFA has been certified to Canada's Standards Association Group Sustainable Forest Management System. This is the leading standard for forest management in Canada (Algonquin Forestry 2020).

Algonquin Provincial Park is also used for an immense amount of recreational outdoor activities. These include camping, hiking, kayaking, canoeing, geo-cashing, fishing and many more(The Friends of Algonquin Park 2020). This array of activities brings just over one million visitors through the park on average per year (The Friends of Algonquin Park 2020).

2.3. LEGISLATION

2.3.1. Canada

Algonquin Provincial Park lies on Algonquian Indigenous land, for which the land claims are complicated but must be elaborated upon. Indigenous treatment in Canada's history is embarrassing to say the least. When it comes to the Algonquian

peoples it is particularly bad. They were altogether left out of the treaty process that swept across Canada in those years, meaning that they never ceded or surrendered their land (Davidson 2019). The Algonquian nation can be split into ten different communities, and of these, one community currently resides on legally designated 'reserve land' (Davidson 2019). After the making of the Royal Proclamation of 1763 and both Constitutional Acts of 1791 and 1867, the Treaty of Algonquin (1764) was written with the goal of general assimilation of aboriginal people to Christianity which involved the Algonquian peoples but not their land (Davidson 2019). The Algonquian nation wrote and submitted twenty-eight petitions to the British government for a treaty with regards to their land between 1772 and 1881 (Davidson 2019). By 1873, the Ontario government placed the Algonquian peoples on the Golden Lake Reserve, while their homeland was subjected to intensive forestry, the settlement of colonialists, and general exploitation of all available resources (Davidson 2019). In 1974 it came to light that the petitions for a treaty had been denied and the Indigenous nation did not have a treaty (Davidson 2019).

By 1992 both Ontario and Canada agreed to start negotiations on a modern-day treaty (Davidson 2019; Ontario 2019). This was a very complicated process in that there were many variables that absolutely had to be dealt with before any real ideas about the land could be put forward. The largest of which was the matter of 'status' and based on the new Indian Act; those Algonquians who chose to leave Gold Lake were no longer considered status (Davidson 2019). In order to take on the huge process of hammering out a modern-day treaty, actively finding those Algonquians who had been stripped of their status and including them in the treaty process was critical (Davidson

2019). This alone caused many more problems than it solved. Through no fault of the Algonquian nation, there were many other variables that made the process long-winded and difficult, including gender inequalities, and lineage tracing problems (Davidson 2019). It wasn't until 2016 that the modern-day treaty was ratified and signed by the parties involved; namely the Ontario Minister of Indigenous Relations and Reconciliation, the Indian and Northern Affairs Canada Minister, and the Algonquin Negotiation Representatives (Davidson 2019; Ontario 2019). In the end, no portion of Algonquin Provincial Park was transferred to the Algonquian peoples; however the agreement did transfer 117,500 acres of other Crown Lands into their ownership (Davidson 2019; Ontario 2019). Along with $300 million as settlement capital which was provided by Canada and Ontario, they also defined Algonquian rights related to lands and natural resources (Davidson 2019) (Ontario 2019). There were no new reserves created, and no land was taken from private owners as a result of the settlement (Davidson 2019; Ontario 2019).

2.4. KEY FACTORS OF COMPARISON

The comparison of the Sustainable Management plans will be based on the data found for vegetation, wildlife, and soil, both historically and currently. There are varying vegetation types and combinations within the evolving ecosystems that can be found for the Menominee Reserve, and Algonquin Provincial Park (2020; Arborvitae 2010; Curtis 1959; Dockery 2012; Henry 2006; Henry 2010; Kay 1982; Leadbitter 2002; Menominee Tribal Enterprises 2020; Quinn 2004; Sands 2008; Waller 2018). The evolution of the forest composition and its coinciding ecosystems over time are a

good indicator of the health of a forest. A comparison of historic and current vegetation will be used to understand the sustainability of today's practices. Consequently, the varying vegetation types over time affect the wildlife in the area as food, habitat and reproduction are cited (Arborvitae 2010; Henry 2006; Quinn 2004; Waller 2018). There are also keystone species, or indicator species in the Menominee Forest, as well as Algonquin Provincial Park whose population will be an important point in the sustainability of the forests themselves (Division of Endangered Species 2016; Kay 1985; Ministry of the Environment 2018; United States Fish and Wildlife Service 2012); Wisconsin Natural Heritage Working List 2016). The third comparison factor is soils, where fluctuations in soil composition are a very important means by which the health of the forest and general sustainability over time can be measured (Baxter 1967; Bockhiem 2016; Hartemilk 2012; Milfred 1967; National Cooperative Soil Survey 2012; Soils Basics 2020). All told, these should make up a comprehensive comparison between the past and present ecosystems of the Menominee Reserve and Algonquin Provincial Park (Remmel 2009).

3. MATERIALS AND METHODS

The goal of this research paper is to answer several questions: Is the Crown Land Sustainable Land Use Management plan in Algonquin Provincial Park, Ontario as sustainable as the Management Plan for the Menominee Forest? Why or why not? How could each of the management plans be amended to be more sustainable? In order to answer all these questions, a baseline of sustainability must first be understood, as for each forest there is what can be considered an ecological history. This goes back to before the Menominee Forest or the forests in Algonquin had any anthropogenic disturbances. The baseline exists right before humans started interfering with the natural processes of the world. The reason why this exists is because there is no point at which those forests could have been more self-sustaining, that is forests at their peak health. The health of the forests is truly the most important aspect of sustainability, and therefore should be the goal of any sustainable management plan. The baseline that was just described is going to be the most important aspect in proving that the Menominee Forest and Algonquin Provincial Park are the same, or whether and why they vary in their levels of sustainability based on their respective management plans.

The baseline will be determined by a few methods. This includes re-photography of photos found either online, in articles, books or archival data. Re-photography is done by taking photographs of the forest and collecting all the meta-data (name, date, camera type, aperture, focal length, position, lens, size of negative, *etc.*). Then a static analysis would be conducted either by the foreground-background method or quadrant analysis. The foreground-background method analyzes the photo in layers

in order to collect the maximum amount of information. Quadrant analysis is the when the photo is actually cut into four to eight quadrants and then everything in those quadrants is analyzed and written down into lists, so as to not miss anything. In this context, the analysis is looking for relevant information within the photo.

An obviously important resource that will be used is the internet. It is a vast and seemingly endless resource that can be used for databases, journal articles, books, websites, statistics, news articles, or archival data. Through the library database you can access almost all those resources. Some of those that have been used for this thesis are the general search through all the databases, dissertations and thesis research to obtain general information on both forests. Searches in the classic catalogue and the government information/data to find government documents on the Menominee and Algonquin Provincial Park were also useful. From there, documents found through those searches can be seperated into peer-reviewed material (a more reliable source), and/or subjects can be chosen to be omitted or further explored. After an article/book/general document has been found and deemed useful, there is always more to look at from within the document. The literature cited is another place to look for information and going through this can lead to more useful documentation. In this way, we can move backwards from the date which that information had been found. Moving forward is an option as well, if you take the title of said information and copy it into google scholar, other papers that have cited that paper will present themselves. By clicking on this "cited by __", those documents will appear and be accessible. This can provide more current information in the same vein as the original document. Some of the papers that come up in google scholar cannot be accessed through Lakehead

University. In that case an interlibrary loan under Scholars Racer Portal has been utilized for articles and books that have been cited.

4. RESULTS

4.1. VEGETATION

4.1.1. Menominee Forest

The Menominee Forest has always been a diverse area comprised of many different landscapes and vegetation compositions. Table 1 shows the important tree species that were present pre-anthropogenic disturbance and that of current day vegetation. That being said, it must be mentioned that there are no documents stating that those species not present in the current day columns have been extirpated. It is only that they are no longer considered fiscally important for wood and timber production. Those species that were considered to be important pre-settlement can be seen in Table 1. Regardless, it can be seen in the comparison of pre-anthropogenic disturbance and current day vegetation that there are no significant differences.

Table 1. Fiscally important trees in the Menominee Forest (Bockheim 2016; Cox 2006; Kay 1982; Menominee Tribal Enterprises 2020; Waller 2018).

Pre-Athropogenic Disturbance		Current Day	
Latin Name	Common Name	Latin Name	Common Name
Acer sccharum	Sugar Maple	*Acer macrophyllum*	Bigleaf Maple
Betula alleghaniensis	Yellow Birch	*Acer negundo*	Box Elder
Betula papyrifera	White Birch	*Acer pensylvanicum*	Striped Maple
Fagus grandifolia	Beech	*Acer rubrum*	Red Maple
Fraxinus nigra	Black Ash	*Acer saccharinum*	Silver Maple
Larix laricina	Larch	*Acer saccharum*	Sugar Maple
Picea spp.	Spruce	*Betula alleghaniensis*	Yellow birch
Pinus resinosa	Red Pine	*Carya spp.*	Hickory
Pinus strobus	White Pine	*Fagus grandifolia*	American Beech

Populus spp.	Aspen	*Fraxinus americana*	White Ash
Quercus alba	White Oak	*Pinus resinosa*	Red Pine
Quercus ellipsoidalis	Northern Pin Oak	*Pinus strobus*	Eastern White Pine
Quercus macrocarpa	Bur Oak	*Populus spp.*	Aspen
Quercus rubra	Red Oak	*Quercus ellipsoidalis*	Pin Oak
Quercus velutina	Black Oak	*Quercus rubra*	Northern Red Oak
Thuja occidentalis	Eastern Cedar	*Taxus canadensis*	Canadian Yew
Tilia americana	American Basswood	*Tilia americana*	American Basswood
Tsuga canadensis	Hemlock	*Tsuga canadensis*	Eastern Hemlock
Ulmus spp.	Elm		

4.1.2. Algonquin Provincial Park

Algonquin Provincial Park has been through some extensive changes since the time before anthropogenic disturbance. Table 2 shows the vegetation that was of importance pre-settlement and current day. Again, it must be mentioned that there are no documents stating that those species not present in the current day columns have been extirpated. It is only that they are no longer considered fiscally important by way of wood and timber production. In this case however, there have been some major declines in abundance for many species. These include (but are not limited to) white pine, American elm, basswood, black cherry, eastern hemlock, eastern white pine, jack pine, larch/tamarack, northern white cedar, red oak, red pine, red spruce, white ash, and yellow birch.

Table 2. Fiscally important trees in Algonquin Provincial Park (2020; ArborVitae 2010; Henry 2006; Henry 2010; Leadbitter 2002).

Pre-Anthropogenic Disturbance		Current Day	
Latin Name	Common Name	Latin Name	Common Name
Abies balsamifera	Balsam Fir	*Abies balsamifera*	Balsam Fir
Acer rubrum	Red Maple	*Acer rubrum*	Red Maple
Acer saccharum	Sugar Maple	*Acer saccharum*	Sugar Maple
Betula alleghaniensis	Yellow Birch	*Betula alleghaniensis*	Yellow Birch
Carpinus caroliniana	Blue Beech	*Betula papyrifera*	White Birch
Fagus grandfolia	American Beech	*Fraxinus americana*	White Ash
Fraxinus americana	White Ash	*Fraxinus nigra*	Black Ash
Fraxinus nigra	Black Ash	*Larix laricina*	Tamarack
Juglans cinerea	Butternut	*Picea glauca*	White Spruce
Juglans nigra	Black Walnut	*Picea nigra*	Black Spruce
Larix laricina	Larch	*Pinus banksiana*	Jack Pine
Ostrya virginiana	Ironwood	*Pinus resinosa*	Red Pine
Picea glauca	White Spruce	*Pinus strobus*	White Pine
Picea rubens	Red Spruce	*Populus …*	Largetooth Aspen
Pinus resinosa	Red Pine	*Prunus serotina*	Black Cherry
Pinus strobus	White Pine	*Quercus rubra*	Red Oak
Populus spp.	Poplar	*Thuja occidentalis*	White Cedar
Prunus avium	Wild Cherry	*Ulmus americana*	American Elm
Prunus serotina	Black Cherry	*Fagus grandifolia*	American Beech
Quercus alba	White Oak	*Tsuga canadensis*	Eastern Hemlock
Quercus rubra	Red Oak		
Thuja occidentatlis	White Cedar		
Thuja plicata	Red Cedar		
Tilia Americana	Basswood		
Tsuga canadensis	Hemlock		
Ulmus americana	American Elm		

4.2. WILDLIFE

4.2.1. Menominee Forest

As can be seen in Tables 3 and 4 there have been some major changes to wildlife in the Menominee Forest since pre-settlement days. It is important to state that many of these conditions existed as a result of factors other than forest management. For instance, those species that were extirpated from the area could have been a result of the fur-trade, overhunting, or some such human activity.

Table 3. Common wildlife present in the Menominee Forest (2009; Kay 1985; Waller 2018).

Pre-Anthropogenic Disturbance		Current Day	
Latin Name	Common Name	Latin Name	Common Name
Alces alces	Moose	*Bonasa umbellus*	Ruffed Grouse
Bison bison	Bison	*Bubo virginianus*	Great Horned Owl
Canis lupis	Wolf	*Canis latrans*	Coyote
Castor canadensis	Beaver	*Canis lupis*	Wolf
Cervus canadensis	Elk	*Castor canadensis*	Beaver
Gulo gulo	Wolverine	*Cyanocitta cristata*	Bluejay
Lynx canadensis	Lynx	*Haliaeetus leucocephalus alascanus*	Bald Eagle
Lynx rufus	Bobcat	*Lutra canadensis*	River Otter
Martes americana	Marten	*Lynx refus*	Bobcat
Martes pennanti	Fisher	*Mephitis mephitis*	Striped Skunk
Meles meles	Badger	*Odocoileus virginianus*	Whitetail Deer
Neovision vison	Mink	*Procyon lotor*	Raccoon
Odocoileus virginianus	Whitetail Deer	*Sciurus carolinensis*	Gray Squirrel
Ondratra zibethica	Muskrat	*Sylvilagus floridanus*	Eastern Cottontail Rabbit
Procyon lotor	Raccoon	*Tamias stratus*	Chipmunk

Puma concolor shorgeri	Cougar	*Ursus americanus*	Black Bear
Rangifer tarandus caribou	Woodland Caribou	*Vulpes vulpes*	Red Fox
Ursus americanus	Red Fox		
Ursus americanus	Black Bear		

Table 4. Species at risk in the Menominee Forest today (2019; Division of Endangered Species 2016; United States Fish and Wildlife Service 2012; Wisconsin Natural Heritage Working List 2016).

Threatened		
Latin Name	Common Name	
Lynx canadensis	Canada Lynx	
Endangered		
Canis latrans	Gray Wolf	
Extirpated		
Alces alces	Moose	
Bison bison	Bison	
Canis latrans	Wolf	
Cervus canadensis	Elk	
Gulo gulo	Wolverine	
Martes americana	Marten	
Martes pennanti	Fisher	
Puma concolor shorgeri	Cougar	
Rangifer tarandus caribou	Woodland Caribou	
Extinct		
Latin Name	Common Name	Year of Extinction
Cervus canadensis	Elk	1880
Ectopistes migratorius	Passenger Pigeon	1914

4.2.2. Algonquin Provincial Park

The wildlife in Algonquin Provincial Park looks as though it has had a similar amount of change as that of the Menominee Forest, based on Tables 5 and 6. This is not quite the case as there are significantly more accounts of declining species population in

the Park. For instance, the population of many songbirds has declined in the recent past and the cause has been attributed to forest management (Quinn 2004).

Table 5. Common wildlife present in the Algonquin Provincial Park (ArborVitae 2010; Henry 2006).

Pre-Anthropogenic Disturbance		Current Day	
Latin Name	Common Name	Latin Name	Common Name
Alces alces	Moose	*Alces alces*	Moose
Canis lycaon	Eastern Wolf	*Canis lycaon*	Eastern Wolf
Caprimulgus vociferous	Whip-poor-will	*Caprimulgus vociferous*	Whip-poor-will
Castor canadensis	Beaver	*Castor canadensis*	Beaver
Cervus canadensis	Elk	*Cheludra serpentina*	Snapping Turtle
Chelydra serpentina	Snapping Turtle	*Emydoidea blandingii*	Blanding's Turtle
Emydoidea blandingii	Blanding's Turtle	*Falcipennis canadensis*	Spruce Grouse
Falcipennis canadensis	Spruce Grouse	*Glyptemys insculpta*	Wood Turtle
Glyptemys insculpta	Wood Turtle	*Haliaeetus leucocephalus*	Bald Eagle
Haliaeetus leucocephalus	Bald Eagle	*Odocoileus virginianus*	White-tailed Deer
Rangifer tarandus caribou	Woodland Caribou	*Strix nebulosa*	Great Grey Owl
Strix nebulosa	Great Grey Owl	*Strix varia*	Barred Owl
Strix varia	Barred Owl	*Ursus americanus*	Black Bear
Terrepene carlina carolina	Eastern Box Turtle	*Zonotrichia albicollis*	White-Throated-Sparrow
Ursus americanus	Black Bear		
Zonotrichia albicollis	White-Throated-Sparrow		

Table 6. Species at risk in the Algonquin Provincial Park today (Ministry of Environment 2018).

Special Concern	
Latin Name	Common Name
Haliaeetus leucocephalus	Bald Eagle
Cheludra serpentina	Snapping Turtle
Threatened	
Caprimulgus vociferous	Eastern Whip-or-will
Emydoidea blandingii	Blanding's Turtle
Canis Lupus	Eastern Wolf
Endangered	
Glyptemys insculpta	Wood Turtle
Extirpated	
Latin Name	Common Name
Rangifer tarandus caribou	Woodland Caribou
Cervus canadensis	Elk
Terrepene carlina carolina	Eastern box Turtle

4.3. Soils

It needs to be clearly stated before proceeding, that the assumptions being made about the soils of both the Menominee Forest and Algonquin Provincial Park are being made on very little information. Those soil maps (Figures 3, 4, 5, and 6) are virtually the only information that is readily available about the soils of these forests. They will be examined to the best of my ability, but the majority of those general assumptions will be made based on the changes that are present in the vegetation. This reference will be

used because of the very close relationship can be found between the changes in vegetation and soil composition (Rodriguez-Loinaz 2008).

4.3.1. Menominee Forest

The changes in soil for the Menominee Forest can be seen when examining Figures 3, 4, and 5. Starting with Figure 3, the soil textures present are sandy soils, sandy loams, calcareous sandy loams, prairie loams, clayey loams (3 different types), and humus soils. The Menominee area in the case looks to be made up of dominantly clayey loams (lighter varieties), and humus soils (mainly muck and peat), with sandy loam scatter here and there. Figure 4 consists of silt loams (2 classes), prairie soils, red clays, sandy soils, silt loams, sandy loams (2 classes), loams rough land, wet land, and peat. The Menominee Forest has Kennan loams, sandy soils, Miami fine sandy loam, and a little bit of peat. In Figure 5, the Menominee Forest is comprised of forested, red, sandy, and loamy soils. There is also a presence of forested, red, sandy, and loamy soils over dolomite. Generally, it can be seen that there has been change in the soils over time. A certain amount of this can related back to the forest management, due to the changes in vegetation that were caused by the management of the forest. Although with an absence of any evidence of clearcutting as a means of management, it is unlikely that there was a significant change caused by forest management (Sundman 1978).

4.3.2. Algonquin Provincial Park

Figure 6 is a representation of data that was found about the soils in Algonquin Provincial Park and it acts as a general reference. It is a mere sliver of Algonquin Park and therefore cannot be considered representative of the park. It will therefore not be

examined, and is there only for reference as the data present for Algonquin Provincial Park. Based on the existence of clearcutting in the management of the park however, it can be assumed that the soil has gone through significant changes to those forests of the past (Sundman 1978).

Figure 3. Soils Map of Wisconsin, 1882 (Hartemilk 2010).

Figure 4. Soils Map of Wisconsin, 1926 (Hartemilk 2010).

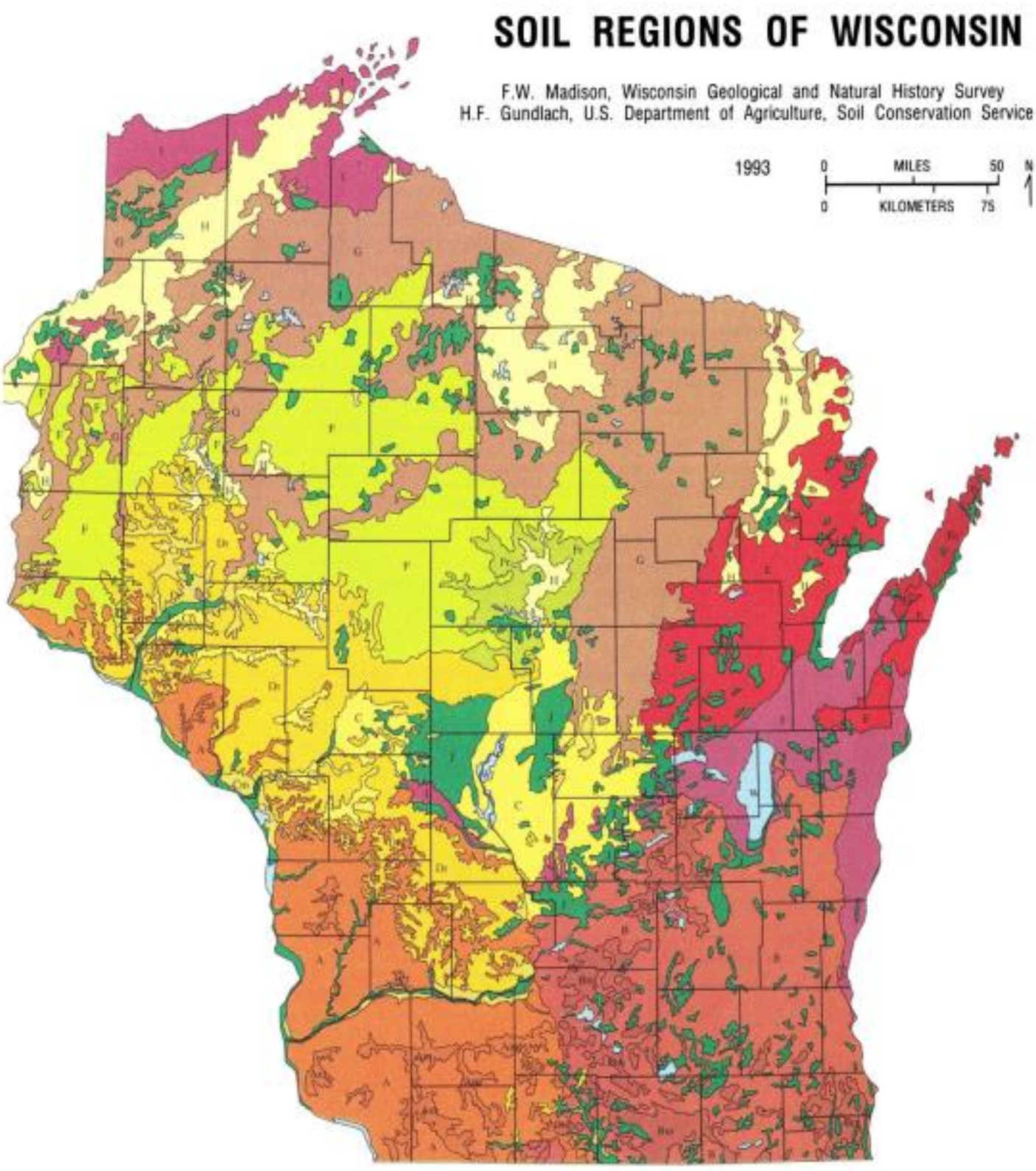

Figure 5. Soils Map of Wisconsin, 1993(Hartemilk 2010).

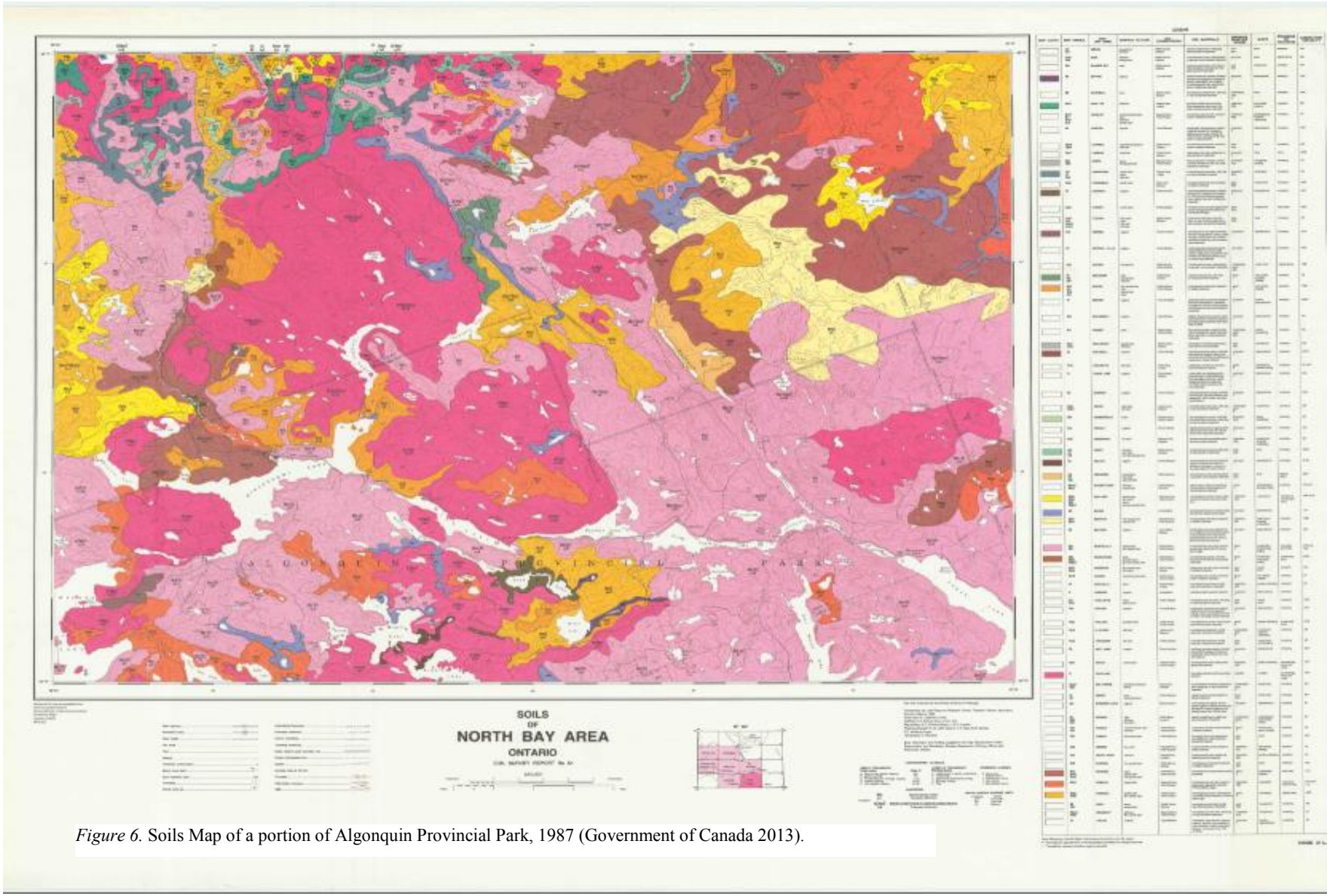

Figure 6. Soils Map of a portion of Algonquin Provincial Park, 1987 (Government of Canada 2013).

5. DISCUSSION

For the sake of this comparison the sustainability of both forests will be categorized through an analysis of the vegetation, wildlife and soils; both historically and currently. All three categories of sustainability will be assessed, first from a historical perspective, and then through the current day lens. Extracted from these assessments will be the differences in impact of the sustainable management plans and how they vary. The productivity will then be evaluated for both the Menominee Forest, as well as Algonquin Provincial Park. Similarly, this section will split into categories; average annual cut per year, average annual income per year, average regeneration rates, etc. Following the productivity section, there will be a discussion of the management styles and main objectives under which both protected forests are administered, and the indigenous involvement incorporated in both the plans. This aspect of the comparison will be purely discussion oriented, giving background information important for the results and evaluation as a whole.

5.1. HISTORIC FOREST CONDITIONS VS. CURRENT DAY FOREST CONDITIONS

It must be noted that the "Historic Forest Conditions" in the case of the Menominee Forest and the area of Algonquin Provincial Park reflect the forests prior to the settlement of Europeans, and therefore not prior to *any* anthropogenic impact, or any truly destructive anthropogenic impact (war, industry, *etc.*).

5.2. MENOMINEE HISTORIC VS. CURRENT

5.2.1. Vegetation

The vegetation in the Menominee Forest has had great diversity in the past as seen in Table 1. According to a thesis on the effects of the historical fire regimes in the Menominee, the forest composition was made of a predominantly mixed mesic forest consisting of hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*), sugar maple (*Acer saccharum*), beech (*Fagus grandifolia*), ironwood (*Ostrya virginiana*), balsam fir (*Abies* balsamifera), black cherry (*Prunus serotina*) and basswood (Sands 2008). Also present were open areas that were taken up by pines (*Pinus strobus*), as well as northern pin oak (*Quercus ellipsoidalis*) (Kay 1982; Sands 2008). These are all based on the U.S. General Land Office's (GLO) Public Land Survey (PLS) which took place in the early- to mid-1800s in the area that is now known as the Menominee forest (Kay 1982). The survey counted as many as 19 different tree species with white pine (*Pinus strobus*), sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*) and hemlock (*Tsuga canadensis*) being the most dominant in their respective ecosystems (Kay 1982; Sands 2008). The total list of fiscally important tree species can be found in Table 1, which was comprised through the cross-referencing of a number of different sources.

5.2.2. Wildlife

The wildlife in the Menominee Forest have suffered the most drastic changes between the current day and pre-settlement forest. These can be seen in Table 3, which was comprised of those species that were present in more than one source. This essentially, shows those animals that were common historically, and to the present. The

reason behind the significant changes in the common wildlife of both periods, are more than likely due to the fur trade in which the Menominee people took part in during the 1800's and early 1900's (Kay 1985). That is to say that the wildlife in the area, had components other than habitat and tree species for survival. Some of these components that must be mentioned are hunting (for sport and survival), the fur trade, and simply unfortunate encounters. Based on the data that was collected, there were no accounts of species gaining status of any kind due to the management of the forest. While all those species that have been extirpated are listed in the above Tables; moose (*Alces alces*), bison (*Bison bison*), wolf (*Canis latrans*), elk (*Cervus canadensis*), wolverine (*Gulo gulo*), marten (*Martes americana*), fisher (*Martes pennanti*), cougar (*Puma concolor shorgeri*), and the woodland caribou (*Rangifer tarandus caribou*). They have been that way since long before the Menominee peoples had full control of their land, in the midst of war, industry and the general chaos of humans.

5.2.3. Soils

Soils are dynamic as its components (minerals, water, air, organic material, and organisms) are in a constant state of change. Some soil components are lost, others are found anew, some transform into others, while some are moved from place to place. Simply said, change in soil composition is to be expected, especially over the course of two-hundred years. Based on Figures 3, 4, and 5, as well as the changes in vegetation, it is evident that there is change to the soil composition over the years in the Menominee Forest. This obviously needs to be taken into account when considering the amount that the soil has changed over the past two hundred years.

5.3. ALGONQUIN HISTORIC VS. CURRENT

5.3.1. Vegetation

The vegetation in the Algonquin Provincial Park has changed immensely at the hand of forest management but is not plainly shown in Table 2, as it shows minimal changes to vegetation. These changes cannot be seen in such a chart because the changes are not based on presence, but on abundance. The tree species in the park are relatively similar, but those that are dominant have changed. It was estimated that 93.7% of white pine (*Pinus strobus*) have been lost since the year 1850 (Quinn 2004). Not only that, there are a number of other species that have declined significantly in the last two-hundred years. These include, American elm (*Ulmus americana*), basswood (*Tilia americana*), black cherry (*Prunus serotina*), eastern hemlock (*Tsuja canadensis*), jack pine (*Pinus banksiana*), larch/tamarack (*Larix laricina*), northern white cedar (*Thuja occidentalis*), red oak (*Quercus rubra*), red pine (*Pinus resinosa*), red spruce (*Picea rubens*), white ash (*Fraxinus americanus*), and yellow birch (*Betula alleghaniensis*) (2020). The conifers were those that were hit the hardest out of them all, and the whole forest was generally less dominated by maples and beech trees (ArborVitae 2010). It has been observed that in the hard-wood zone of the park, 77% of that is a maple-beech-hemlock composition (ArborVitae 2010). The forests of Algonquin Park have also had notable old growth loss, showing a definitive change from the historic forests (ArborVitae 2010). Generally, it was clear that there was simply a loss of diversity among the fiscally important trees of the park.

5.3.2. Wildlife

Algonquin Park is known in Canada for its wildlife, possessing a combination of two-hundred and nine species of mammals, breeding birds, reptiles and amphibians (ArborVitae 2010). While that is the case, there is controversy about the effects that forest management is having on the songbirds of Algonquin. This is probably due to changes in percent-canopy cover, which has significant effects on the general bird populations (ArborVitae 2010). The whip-or-will (*Caprimulgus vociferous*) for instance, currently has endangered status in the Algonquin Provincial Park area. In addition, there have been some abundance variation with those species we know best (Ministry of Environment 2018) such as; the beaver (*Castor canadensis*), moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), and the extirpated elk (*Cervus canadensis*), and woodland caribou (*Rangifer tarandua caribou*) (ArborVitae 2010). From those species, the beaver populations have been declining in this area in general. The appearance of white-tailed deer in the late 1800's has been labelled as the cause of declining moose populations, as well as a possible cause of the extirpation of both elk and caribou (ArborVitae 2010).

5.3.3. Soils

As was said above, soils are dynamic, and its components (minerals, water, air, organic material, and organisms) are in a constant state of change. As some components are lost, others are found anew, some transform into others, while some are moved from place to place. Simply said, change in soil composition is to be expected, especially over the course of two-hundred years. This obviously needs to be taken into account when considering the amount that the soil has changed over the past two hundred years.

Algonquin Provincial Park actually has very little data available for the soils of its forests. There was one soil map that was found, Figure 6, and from this you have a general idea of what the soils of Algonquin looked like (Government of Canada 2013). From there it may be assumed that the soil has changed significantly, with historically intensive forestry having occurred in the area for over a hundred years (Sundman 1978). With the sheer number of clearcutting in the area, it can also be assumed that part of the change in soil composition was caused in part by the forest management at that time (Sundman 1978).

5.4. PRODUCITVITY

The productivity of the forest management plans of the Menominee Forest and Algonquin Park are not directly related to the sustainability of the plan. Ensuring maximum productivity is however, crucial for business of any kind. It will therefore be given some consideration on this study.

What will be examined and discussed in full once everything is collated below is the annual income per year per square meter of harvested land. This data has been stated in the results, and will be stated again now. The Menominee Forest, with Menominee Tribal Enterprises unfortunately does not have their financial records for these fiscal years available to the public. The best comparison would be to use the only one that has evidently been made available in a *Regional Economic Impact of Menominee Tribal Enterprises Forestry and Mill Operations* (2007) (Clements 2008). Although this is not a recent document it is the only one to be found. Menominee Tribal Enterprises had an economic output of $108 million with a harvest of approximately thirty broad feet (2787091.2 m^3), paying about $38.75 m^{-3} (Clements 2008). The scale of

harvest in the Algonquin Forest is much higher than the Menominee Forest, as is evident in the numbers. Algonquin Provincial Park, with the Algonquin Forestry Authority (AFA) contributed $310 million to Ontario's economy with a harvest level of 368699 m^3 (Algonquin Forestry 2020). The payout is approximately $840.79 m^{-3}. Based on the amount of land and available harvesting wood for both of these forests, as well as their different management styles, these numbers are quite logical (Algonquin Forestry 2020; Clements 2008). There is also something to be said about the management styles, in order to keep up all of their certificates the Menominee Forest has put their finances into different aspects of the forest, than Algonquin Provincial Park (Menominee Tribal Enterprises 2020). These include

5.5. INDIGENOUS INVOLVEMENT

5.5.1. Menominee Forest

The Menominee people have been using the forest for sustainably harvesting wood for over a hundred and fifty years. The Menominee people have maintained the value that hurting the forest in any way is the equivalent to hurting themselves. They have also embraced the philosophy of "what's the best for the forest?" (Menominee Tribal Enterprises). This philosophy has kept the forest safe and sustained the overall health of the forest for those hundred and fifty years of practice. This is evident when looking at the vegetation, wildlife and soils of the forest as was previously discussed, with the exception of the wildlife (due to other extenuating factors), fairly similar to that of the historic forest.

They pride themselves on having a management plan with the utmost levels of ecological viability, economical feasibility, and social desirability (Menominee Tribal Enterprises 2020). The more practical side of the philosophy focuses on using area and volume control along with even-/uneven-aged management to maintain a healthy forest (Patton 2010). Another component of the practical philosophy is organization, with eight-hundred and eighty-four continuous forest inventory plots in one hundred and nine compartments (Patton 2010). Along that line there are also limits on the allowable cut not to exceed 7% annually, 3% in a five year period and 2% over a fifteen year cutting cycle (Patton 2010). As of right now the Menominee Forest works under adaptive sustained yield procedures, this is applicable within the wide variety of forest types, habitat niches and age classes (Menominee Tribal Enterprises 2020; Patton 2010). As well, allowing for maximum diversity in all aspects of the forest, habitat diversity, and the optimization of growth and quality of saw logs are the goals for forest management (Menominee Tribal Enterprises 2020).

5.5.2. Algonquin Provincial Park

Algonquin Provincial Park measures 7,635 km^2 in its entirety, and with current day forestry practice is an adequate example of how forestry on Crown land protected areas is being managed all over Ontario (Algonquin Forestry 2020). There are a number of varying levels of management at different governmental levels. There is more specific documentation in regards to managing the forests of Algonquin Provincial Park Management Plan (1998, with amendments last in 2013; Benidickson 2009; Ontario 1998; Algonquin Forestry 2020). The methods of the harvesting in the park are 95% selection based (partial cuttings systems), while the other 5% are clear-cuts (Algonquin

Forestry 2020). Selection harvesting is used as a means of removing chosen trees and keeping those trees of a better quality. The trees in this case are like most plantations where the seeds are set out in uniform spacing for regeneration (Algonquin Forestry 2020). The clear-cutting portion of the park is, according to the Ontario government, used to emulate natural disturbance and to create a section of early successional habitat, attempting to maintain natural diversity (Algonquin Forestry 2020). Making up about 44% of the volume harvested yearly from all Central and Eastern Ontario Crown forests, Algonquin Forestry is a huge economic factor in Canada (Algonquin Forestry 2020).

It should be noted that there is no indigenous involvement in the management of Algonquin Provincial Park. The history of the park as stated above indicates that the relationship between the Algonquin peoples that used to live on that land is strained. Due to this stressed relationship, and by no fault of the Algonquin peoples, there was no traditional knowledge used to make the forest management plans.

6. CONCLUSION

All of this data when looked at separately is not comprehensive, so now we must bring it all together. Looking at both of these forests as independently whole working and living ecosystems is not useful. Comparatively, the Menominee Forest has changed all together but with a certain grace, there have been no significant changes except to that of the wildlife. That specific change was due to factors that were not related to the management of the forest. Otherwise, with regard to the vegetation and therefore the soils there have been significant changes since the pre-anthropogenic disturbance forest. By all accounts, the Menominee Forest seems to be sustainably managed. There is an abundance of old growth and the biological diversity is considered at every step up of the plan. Not only that, but minimal change is natural for any ecosystem as they exist in a constant state of change. These forests are ever evolving to their environments and those disturbances that are constant in the life of any ecosystem.

Algonquin Provincial Park as a whole ecosystem has changed in the last two hundred or so years. The pre-anthropogenic forest was conifer dominant with elk and caribou, and although forest management cannot be labelled as the sole cause of these unnatural changes, it must take partial responsibility for them. Clearcutting is the underlying problem for this park; however, it is better now than it has ever been, but there is still work to be done. The ecosystem that is Algonquin Park needs to be replenished. With the tree changes in abundance, and the extirpated species, as well as the clearcutting that is still going on, the forest continues in comparison to the pre-anthropogenic disturbance forest, to be less and less diverse. Biodiversity as a whole is

and will always be an indicator of sustainability, so where does Algonquin rank? Where does the rest of the Crown forest being managed under the same rule rank?

The Menominee Forest and Algonquin Provincial Park are two very well known, and generally well researched forests. In spite of that, there are certain aspects of these areas that are in dire need of current research. One aspect in particular would be the Algonquin Provincial Parks soil surveys, of which the most recent is from the 1960's. With the amount of change that can happen over the course of sixty years, especially with constant harvesting, including methods such as clearcutting, it is important to have up to date information in order to keep the forest as healthy as possible. There is also the interesting fact that the productivity pricing over the amount of timber sold for the Menominee Forest is not available anywhere on the internet. This is odd only because of the general transparency that Canada exhibits in such matters. Everything else regarding this study was fairly straight forward when it came to finding information. The Menominee Forest was found to be the more sustainable of the two management plans. This was based on a comparison between the vegetation, wildlife, soils, and productivity of both forests. Algonquin Provincial Park is now being called upon, on the basis of this thesis to revise and consider looking into more sustainable measures for the park.

As a result of all of the data that was compiled for this thesis, it can be interpreted that the Menominee Forest is more sustainably managed. When the vegetation, wildlife, soils and productivity are examined collectively and compared to that of Algonquin Provincial Park, it can be seen quite clearly that the Menominee Forest is closer to its

historic forest regime. Therefore, they have proven that their sustained-yield method of management is ultimately more sustainable.

7. LITERATURE CITE

2009. Wisconsin Wildlife. Wisconsin-WI.com. https://wisconsin-wi.com/wisconsin-information.html. Date viewed 03/12/20.

2019. Extinct Species. Midwest Region Endangered Species. United States Fish and Wildlife Service Midwest Region. Bloomington, MN. https://www.fws.gov/midwest/endangered/lists/extinct.html. Date viewed 03/12/20.

2019. Algonquin Park Maps. Voyageur Quest. https://www.voyageurquest.com/algonquin-provincial-park/maps/

2020. A project to find and document endangered old-growth forests in Algonquin Park. Save Algonquin's Old-growth Forests. https://savealgonquinoldgrowth.org/. Date viewed 03/22/20.

Algonquin Forestry. 2020. Algonquin Forestry Authority. http://algonquinforestry.on.ca/algonquin-park-history/. Date viewed 09/01/19.

Algonquin's of Ontario. 2013. Algonquin Treaty Negotiation Funding Trust. http://www.tanakiwin.com/algonquins-of-ontario/who-are-the-algonquins-of-ontario/. Date viewed 09/01/19.

ArborVitae Environmental Services (AVES) Ltd. 2010. Management of Algonquin Park's West Side Forests and Provision of Associated Habitat.

Baxter, F. P., W. A. Creed, F. G. Goff, F. D. Hole, C. J. Milfred, and G. W. Olson. 1967. University of Wisconsin. United States of America.

Beck, D. 2002. Siege and Survival: History of the Menominee Indians, 1634-1856. (Online).

Beck, D. 2005. The Struggle for Self-Determination: History of the Menominee Indians Since 1854. University of Nebraska Press, United States of America.

Benidickson, Jamie. 2009. Legal framework for protected areas: Ontario (Canada). IUCN-EPLP No.81. (Online).

Bockheim, J. G. and A. E. Hartemink. 2016. The Soils of Wisconsin. World Soils Book Series, Springer. (Online).

Burgess, D. 1996. Forests of the Menominee – a commitment to sustainable forestry. The Forestry Chronicle 72(3): 268-275.

Clements, J. and D. Marcouiller. 2008. Regional Economic Impacts o fthe Menominee Tribal Enterprises Forestry and Mill Operations. University of Wisconsin. Madison, Wisconsin. Page ii.

College of Menominee Nation Sustainable Development Institute: Research Education Outreach. Shuttle Themes. http://sustainabledevelopmentinstitute.org/research-2/phenology/. Date viewed 01/03/19.

Corbett, Carl. 2001. Sustainable forest management in Algonquin Provincial Park. The Forestry Chronicle. Vol. 77, No. 5. (Online).

Cox, D. G., N. O. Ross, and D. L. Medin. 2006. Culture and Resource Conflict: Why Meanings Matter. Russell Sage Foundation. Pages 155-160. (Online).

Davidson, Jenna. 2019. Lessons from Algonquin Territory: Conceptualizing land claims agreements in land-use. York University. Toronto, Ontario, Canada.

Division of Endangered Species. 2016. Federally Endangered and Threatened Species in Wisconsin. United States Fish and Wildlife Service. New Franken, Wisconsin. (Online).

Dockery, M. J. 2012. Indigenous Forestry in the Americas: Comparative Environmental Histories in Bolivia and Wisconsin. University of Wisconsin-Madison. United States of America. Pages 20-60.

Government of Canada. 2013. Soils of North Bay Area (No Report). http://sis.agr.gc.ca/cansis/publications/surveys/on/on54/index.html. Date viewed 04/11/20.

Hamilton, E. 2018. Tribal forests in Wisconsin are more diverse, sustainable. University of Wisconsin-Madison. (Online).

Hartemilk, A. E., B. Lowery and C. Wacker. 2012. Soil Maps of Wisconsin. Geoderma. University of Wisconsin-Madison: Department of Soil Science, Madison, Wisconsin. Pages 451-461. (Online).

Hemming, S., S. Muller, and D. Rigney. 2019. Indigenous sovereignties: relational ontologies and environmental management. Geographical Research 57(4): 399-410. (Online).

Henry, M. 2010. Old-growth forests in Algonquin Park [2]. Ontario's old-growth forests. GeneratePress. (Online).

Henry, M. and Quinby, P. 2006. A Preliminary Survey of Old-Growth Forest Landscapes on the West Side of Algonquin Provincial Park, Ontario. Ancient Forest Exploration and Research.

Kapp, A. 2019. The Menominee Indian Tribe of Wisconsin, August. Climate Change Program, Institute for Tribal Environmental Professionals, Northern Arizona University. (Online).

Kay, J. 1982. The Ecological Basis of Menominee Ethnobotany. Journal of Cultural Geography 2.

Kay, J. 1985. Native Americans in the Fur Trade and Wildlife Depletion. Environmental Review: ER, 9(2), 118-130. (Online).

Leadbitter, P., D. Euler, and B. Naylor. 2002. A comparison of historical and current forest cover in selected areas of the Great Lakes-St. Lawrence Forest of central Ontario. The Forestry Chronicle 78(4). (Online).

Marinette Count Government. 2017. Forestry Department. dmi studios, Mariette Wisconsin. Government website. https://www.marinettecounty.com/departments/forestry-br/general-information/maps-24ae890f9199/. Date viewed 01/03/19.

Menominee Tribal Enterprises. 2020. Menominee Tribal Enterprises. https://www.mtewood.com/SustainableForestry/MenomineeForest. Date Viewed 01/03/19.

Milfred, C.J., G.W. Olson, and F.D. Hole. 1967. Soil Resources and Forest Ecology of Menominee County, Wisconsin 85(60). State of Wisconsin. Madison, Wisconsin. (Online).

Ministry of the Environment, Conservation and Parks. 2018. Government of Ontario. Queen's Printer for Ontario. https://www.ontario.ca/page/species-risk-ontario#section-5. Date viewed 03/19/20.

Mitchell, M.J. and R.M. Johanannes. 1967. Soil Srvey of Menominee County, Wisconsin. Menominee County. United States Department of Agriculture, and Natural Resources Conservation Service. (Online).

National Cooperative Soil Survey U.S.A.. 2012. Menominee Series. https://soilseries.sc.egov.usda.gov/OSD_Docs/M/MENOMINEE.html. Date viewed 01/03/19.

Ontario, Government. 1998. Algonquin Provincial Park Management Plan. Queen's Printer for Ontario. Ontario, Canada.

Ontario, Government. 2014. Crown land management. Queen's Printer for Ontario. https://pubs.cif-ifc.org/doi/pdf/10.5558/tfc77836-5. Date viewed 25/01/2020.

Ontario, Government. 2019. The Algonquin land claim. Queen's Printer for Ontario. https://www.ontario.ca/page/algonquin-land-claim#section-4. Date viewed 31/01/2020.

Patton, David R. 2010. Forest Wildlife Ecology and Habitat Management. Taylor and Francis Group, Boca Raton. (Online).

Puric-Mladenovic, D. 2011. Pre-settlement Vegetation Mapping for the Greater Toronto Area, including the Regions of Hamilton, Halton, Peel and York and the Credit Valley Watershed. Ontario Ministry of Natural Resources. Southern Science and Information Section. Peterborough Ontario.

Quinn, Norman W.S. 2004. The presettlement hardwood forests and wildlife of Algonquin Provincial Park: A synthesis of historic evidence and recent research. The Forestry Chronicle 80:6. (Online).

Reining, Catherine E. 2019. Does perceived ecological integrity affect restorative health outcomes? An examination of visitor experiences in diverse environments in an Ontario Protected Area. *Theses and Dissertations* 2202. (Online).

Remmel, T.K. 2009. Algonquin Park: the human impact. In Euler, D. and M. Wilton (eds.). Espanola: Algonquin Eco Watch.

Rodriguez-Loinaz, G., M. Onaindia, I. Amezaga, I. Mijangos, and C. Garbisu. 2008. Relationship between vegetation diversity and soil functional diversity in native mixed-oak forests. Soil Biology & Biochemistry 40(49-60). (Online).

Sands, B. A. 2008. Assessing the Impact of Historical Fire Regimes and Logging on Forest Composition, Structure, Regeneration, and Radial Growth on the Menominee Tribal Lands, Menominee County, Wisconsin. Penn State University. United States of America.

Soil Basics. 2020. Soil Science Society of America. Madison, Wisconsin. https://www.soils.org/about-soils/basics. Date viewed 03/27/2020.

Strickland, M. 1853. Twenty-seven tears in Canada West, or, the experience of an early settler. R. Bentley (S. Bentley), London.

Sundman, V., V. Huhta, and S. Niemela. 1978. Biological changes in northern spruce forest soil after clear-cutting. Soil Biology and Biochemistry. 10 (5). Pages 393-397. (Online).

The Friends of Algonquin Park. 2020. Friends of Algonquin. Whitney, Ontario. http://www.algonquinpark.on.ca/news/2018/celebrating_125_years.php. Date viewed 03/22/20.

Trosper, Ronald L. 2007. Indigenous influence on forest management on the Menominee Indian Reserve. Forest Ecology and Management 249: 134-139. (Online).

United States Fish and Wildlife Service. 2012. Report to Congress on the Recovery of Threatened and Endangered Species: Fiscal Years 2009-2010. United States Fish and Wildlife Service Endangered Species Program. (Online).

Waller, D. M., and N. J. Reo. 2018. First stewards: ecological outcomes of forest and wildlife stewardship by indigenous peoples of Wisconsin, USA. Ecology and Society 23(1):45. (Online).

Whiteduck, Kirby. 2009. Our Majestic Forests: An Aboriginal View of Algonquin Park. Algonquin Park: the Human Impact. Algonquin Eco Watch. 36-56.

Wisconsin Natural Heritage Working List. 2016. Wisconsin Natural Heritage Program, Bureau of Natural Heritage Conservation. Madison, Wisconsin. (Online).

Wisconsin Department of Public Instruction. Menominee Indian Tribe of Wisconsin. https://dpi.wi.gov/amind/tribalnationswi/menominee. Date viewed 03/22/20.